New Official Remedies

1890

STOCKMAN

NEW OFFICIAL REMEDIES

CONTAINING

ALL THE DRUGS AND PREPARATIONS

CONTAINED IN

THE ADDENDUM (1890)

TO THE BRITISH PHARMACOPŒIA OF 1885

With Pharmacological and Therapeutical Notes

ADAPTED FOR THE USE OF STUDENTS AND PRACTITIONERS

BY

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PREFATORY NOTE

THE Additions made in 1890 to the British Pharmacopœia of 1885 are forty-four in number. Of these, seventeen are new drugs, eight are galenical preparations of the new drugs, eighteen are new preparations of drugs already official, and one is in the Appendix.

For convenience of reference they may be tabulated thus:

New Substances.	*Preparations.*
Acetanilidum (Antifebrin)	
Adeps Lanæ	Adeps Lanæ Hydrosus (Lanoline).
Eucalypti Gummi	
Euonymi Cortex	Extractum Euonymi Siccum.
Gelatinum	
Glusidum (Saccharin)	
Hamamelidis Cortex	Tinctura Hamamelidis.
Hamamelidis Folia	Extractum Hamamelidis Liquidum. Unguentum Hamamelidis.
Homatropinæ Hydrombromas	
Hydrastis Rhizoma	Extractum Hydrastis Liquidum. Tinctura Hydrastis.
Oleum Cadinum	
Paraldehydum	
Phenacetinum	
Phenazonum (Antipyrine)	
Picrotoxinum	
Strophanthus	Tinctura Strophanthi.
Sulphonal	

New Preparations of Substances already official.

Acetum Ipecacuanhæ.
Emplastrum Menthol.
Liquor Cocainæ Hydrochloratis.
Liquor Morphinæ Sulphatis.
Liquor Trinitrinæ (Nitroglycerine Solution).
Magnesii Sulphas Effervescens.
Mistura Olei Ricini.
Pilula Ferri.
Pulvis Sodæ Tartaratæ Effervescens (Seidlitz Powder).
Sodii Benzoas.
Sodii Nitris.
Sodii Phosphas Effervescens.
Sodii Sulphas Effervescens.
Stramonii Folia.
Suppositoria Glycerini.
Syrupus Ferri Subchloridi.
Trochisci Sulphurio.
Unguentum Conii.

New Preparation in Appendix.

Solution of Potassio-Cupric Tartrate (Fehling's Solution).

NEW OFFICIAL REMEDIES

CONTAINED IN

Pharmacological and Therapeutical Notes

ON THE ADDENDUM (1890)

TO THE BRITISH PHARMACOPŒIA OF 1885

ACETANILIDUM.

Acetanilide; Phenylacetamide; Antifebrin.

C_8H_9NO.

Mode of Preparation.—It is prepared by the prolonged heating together of glacial acetic acid and aniline, the product being subsequently purified.

During the heating an atom of hydrogen in aniline ($C_6H_5.NH_2$) becomes replaced by the radical acetyl (C_2H_3O), and we get formed acetanilide ($C_6H_5.NH.C_2H_3O$). The name phenylacetamide was long ago given to it by chemists to indicate its chemical constitution; thus aniline may be regarded as ammonia (NH_3) in which one hydrogen atom has been substituted by phenyl (C_6H_5), while phenylacetamide is ammonia in which two hydrogen atoms have been replaced by phenyl and acetyl respectively, thus—

$$N\begin{cases} H \\ C_6H_5 \\ C_2H_3O \end{cases}$$

When it was first introduced into medical use it was called antifebrin to indicate its powerful antipyretic action.

Characters and Tests.—It occurs in colourless, glistening, scaly crystals, having a slightly pungent taste and no smell. Although it is an alkaloid, its solution is neutral in reaction. It is soluble in about 200 parts of cold water, and 18 parts boiling water, freely in rectified spirit, ether, benzol, and chloroform. When perfectly dried it melts at about 235° F. (112°·8 C.) to a clear colourless fluid.

On combustion it should leave no residue; its solution in water is not coloured by perchloride of iron (absence of free acetic acid); it forms with sulphuric acid a colourless solution; heated with solution of potash and a few drops of chloroform, the unpleasant odour of phenyl-isonitrile is developed (aniline reaction).

Additional tests are as follows: Heated in a capsule with mercurous nitrate, it gives an intense green colour, the green substance being soluble in alcohol; a trace of it gives a blue colour with a few drops of a solution of bleaching powder and a crystal of phenol.

The presence of free aniline (which is a toxic substance) may be detected by adding to a solution of acetanilide a few drops of a solution of sodium hypobromite, when the liquid should remain limpid and yellow. If aniline be present, however, a reddish-orange precipitate is formed.

Acetanilide is a very stable substance, difficult to decompose, and only after prolonged heating with caustic potash or hydrochloric acid does it split up, yielding aniline and acetic acid.

Dose.—3 to 10 grains. It is best given as a powder suspended in a little water, or in cachets, capsules, or wafer paper; it can also be given dissolved in wine, spirits, tincture of orange-peel, or aromatic spirit of ammonia, or as a pill with glycerine of tragacanth. (Cachets are made

of wafer paper, and consist of two watchglass-shaped halves, which cohere on moistening the edges).

Pharmacological Action.—Observations on man and animals have shown that acetanilide acts as a powerful depressant of the nervous system. In large doses it markedly diminishes the spinal reflexes, and interferes with sensory and motor conduction in the cord. There is always a certain amount of analgesia produced, and, with very large doses, there may be complete sensory and motor paralysis. Tremors, sometimes deepening into convulsive movements, a marked fall in the temperature, coma, retention of urine and general paralysis, are seen with very large doses. The automatic functions of the medulla oblongata are markedly depressed. Consciousness is maintained until very late in the poisoning, and the cerebral functions are but little affected at a period when the spinal cord is deeply involved.

Acetanilide has also a marked effect on the blood; in one or two hours, after administration of a large dose, the blood becomes of a chocolate colour from formation of methæmoglobin; it also contains less oxygen, its oxidising powers are much diminished, and there is a decrease in its alkalinity. Under the microscope the red corpuscles are seen to be more globular and somewhat granular, and do not form rouleaux. Their number is diminished, and the hæmoglobin falls about 10 to 18 per cent. below the normal. Blood-colouring matter may be found dissolved in the serum, especially if large doses have been given for some time. Small or moderate doses do not appreciably affect the blood.

In consequence of these actions on the blood and nervous system, poisonous doses tend to cause cyanosis, great dyspnœa, and collapse. These are, however, essentially

symptoms of toxic doses. As a rule, a healthy man feels or shows no effects after 7 to 10 grains; but in a person suffering from pain or fever, the action of the drug is at once apparent by the partial or total disappearance of these symptoms. In either case a repetition of the same dose, shortly after, may induce somnolence, headache, and general malaise, with cyanotic colour of the face and extremities.

The heart may be slightly stimulated at first, and the blood vessels contracted; but on the circulation and respiration medicinal doses have no appreciable effect. Poisonous doses depress both greatly — the pulse is weakened and thready, and the respiration becomes at first rapid, and then impaired and laboured. It has been stated by certain observers, that the peripheral terminations of motor nerves are also more or less paralysed. In the normal subject full medicinal doses have generally no effect on the temperature. If fever be present, the temperature begins to fall within an hour, reaches its minimum in two or three hours, and gradually returns to its previous height in from four to ten hours. Small doses, such as one or two grains, given every hour, also reduce high temperature. The fall of temperature is often accompanied by profuse sweating, but is not due to this, as an equal reduction is obtained if the sweating be prevented by previous administration of atropine. The subsequent rise may be accompanied by rigors or a feeling of chilliness. Observers are agreed that the reduction of temperature in fever is due to diminished heat-production, but there is some difference of opinion as to whether increased heat-dissipation plays a part in it or not.

The urine is reddish-yellow in colour from its richness in urobilin, and reduces Fehling's solution to some extent, and, if the dose has been large, may contain a trace of

albumin. Acetanilide is not found as such in the urine. It seems to be partially split up in the body, a portion being excreted in the same form as aniline is, namely, as para-amido-phenol-sulphate (or glycuronate), while another portion is excreted as acetyl-para-amido-phenol-sulphate. When boiled with hydrochloric acid, these combinations yield para-amidophenol. Hence the presence of the decomposition products of acetanilide may be detected in the urine by boiling it for a few minutes with about one quarter its volume of hydrochloric acid, allowing it to cool, adding a few cubic centimetres of a 3 per cent. solution of phenol, and a small quantity of a solution of chromic acid or ferric chloride. In the presence of amidophenol, the fluid becomes red, and, on adding excess of ammonia, blue (indophenol reaction). The toxic effects of acetanilide have been attributed to the action of aniline formed in the organism from it. A larger or smaller formation of aniline would explain its frequent differences of action, and would account for the so-called idiosyncracies. The two bodies, however, are so closely allied chemically, that their actions are probably very similar.

Acetanilide is a feeble antiseptic, and also a very feeble muscle poison.

Therapeutical Uses.—As an antipyretic.—Acetanilide was introduced into medicine by Cahn and Hepp (*Cbl. für klin. Med.*, 1886, and *Berlin klin. Wochenschr*, 1887), who described it as a powerful and certain antipyretic, acting with about one-fourth of the dose of antipyrine. It has been used with satisfactory results in pneumonia, typhoid fever, acute rheumatism, phthisis, and other febrile conditions. In no case has it any specific effect on the course of the disease, but the temperature is lowered, and

the patient's comfort increased partly thereby, and partly by the analgesic action on the nervous system. In asthenic conditions it is apt to produce severe depression, and in phthisis uncomfortable sweating. To avoid these results it has been administered in ½ to 2 grain doses every hour or two hours, and this has sufficed to keep the temperature at or about normal without risk. With children special caution and very small doses are advisable ($\frac{1}{6}$ grain for each year of age). Three to six grains are usually given for a dose, but up to ten or even fifteen grains may be quite well borne by many people. This must, however, be regulated to a very large extent by the condition of the patient.

As an analgesic.—Acetanilide does well in facial, intercostal, and other neuralgias, in muscular pains, and pain from acute or sub-acute inflammations, in chronic rheumatism, and in pruritus. In migraine, general headache, and locomotor ataxia pains it gives relief. It depresses and quiets the nervous system generally, and hence is good in the irritability and sleeplessness sometimes seen in surgical cases. Its value in epilepsy is, to say the least, extremely doubtful.

Dangers and Disagreeable Effects.—The prolonged use of acetanilide is not without danger, especially in the anæmic, whom it makes more anæmic; but even healthy persons suffer in this way. In animals its frequent administration has led to fatty degeneration of the viscera.

Poisoning is not apt to occur if acetanilide be used with care. The symptoms are a feeling of fatigue, faintness, palpitation and anxiety, with nausea, vomiting, and diarrhœa, accompanied by lividity, cyanosis, and great disturbance of the circulation, respiration, and nervous system. A very

mild degree of cyanosis is not infrequently seen, the finger-tips becoming bluish in colour. The treatment of poisoning consists in emptying the stomach and bowel, subcutaneous injection of ether and caffeine, and preventing loss of heat by enveloping the body in blankets. The administration of alcohol by the mouth should be avoided, as it dissolves up the antifebrin, and hastens its absorption.

The disagreeable effects which are sometimes produced by acetanilide are severe sweating and consequent miliary eruptions, an unexpectedly large fall of temperature, or an unexpectedly sudden rise with rigors. Exanthematous eruptions, disturbances of the digestive system, deafness and mydriasis are all very rare. It is very well borne by the stomach.

ACETUM IPECACUANHÆ.

Vinegar of Ipecacuanha.

Mode of Preparation.—One ounce of ipecacuanha (in No. 20 powder) is moistened with diluted acetic acid, and macerated for twenty-four hours; it is then packed in a percolator, and more diluted acetic acid is allowed to percolate through until the product measures one pint.

Dose.—5 to 40 minims as an expectorant.

Therapeutical Uses.—This preparation is almost exactly the same strength as the vinum ipecacuanhæ. It is intended to be used as an expectorant, and in cases where comparatively small doses are indicated. It is scarcely suitable for use as an emetic, owing to the large quantity of acetic acid which would have to be administered. Being acid, it is of course incompatible with ammonium carbonate, aromatic spirit of ammonia, and other alkaline preparations.

ADEPS LANÆ.

Wool Fat.

The purified cholesterin fat of sheep's wool.

Mode of Preparation.—From sheep's wool a large quantity of a fatty substance can be obtained. Before purification this consists of about 45 per cent. of cholesterin fats, about 30 per cent. of free fatty acids, some other bodies of the same kind, and small quantities of volatile fatty acids, such as caproic acid, to which its peculiar odour is due. For medical use the cholesterin fats must be separated from the other substances. This is done by treating the unpurified wool fat with an aqueous alkaline solution. The alkali saponifies the free fatty acids, but not the cholesterin fat; and when the mixture is centrifuged it separates into two layers, the cholesterin fat rising to the top. It is then easily drawn off, but has to undergo a further series of purifying processes before it is ready for use.

Characters and Tests.—It is a yellow, tenacious, unctuous substance, almost inodorous, with a melting point varying from 104° F. (40° C.) to 111° F. (43°·9 C.); readily soluble in ether and in chloroform, sparingly soluble in rectified spirit. Ten grains should dissolve almost completely in fourteen fluid drachms of boiling ethylic alcohol, the greater part separating in flocks on cooling. Ignited with free access of air, it burns, leaving but a trace of ash. Fifty grains, dissolved in four fluid drachms of ether, and two drops of tincture of phenolphthalein added, should not require more than two grain measures of volumetric solution of soda to produce a permanent red coloration (absence of free acids). The solution in chloroform, poured gently over the surface

of sulphuric acid, acquires a purple-red colour (cholestol reaction). Heated with solution of soda, no ammoniacal odour should be evolved.

PREPARATION.—Adeps Lanæ Hydrosus. Hydrous Wool Fat; Lanoline.*

Mode of Preparation.—It is prepared by melting 70 parts of wool fat in a warm mortar, and stirring in thoroughly 30 parts of distilled water.

Characters and Tests.—It is yellowish-white in colour; faint odour, never rancid. When heated it separates into an upper oily and lower aqueous layer; otherwise same as wool fat.

Composition and Properties.—In the course of an extended investigation on the keratin tissues, Liebreich found that human skin, hair, vernix caseosa, horn, hoof, feathers of birds, and a number of other keratinous tissues, all contain cholesterin fats. (*Berlin. klin. Wochenschr*, 1885. *B.M.J.*, i., 1886. Also *Deutsch med. Wochenschr*, 1886.) In 1868 Hartmann and Schulze had previously shown that sheep's wool contains a great abundance of cholesterin fat. Liebreich, however, has very greatly extended our knowledge of the whole subject, and has shown that the peculiar fatty substance is a degeneration product of the keratin cells, and is not secreted by glands. He also found it in the liver, kidneys, and blood of rabbits; and it is owing to his recommendations that it has been re-introduced into use. An impure wool fat was largely used and highly esteemed by the ancient Greeks and Romans as a cosmetic and salve, the use of which can

* The name "Lanoline" is a registered trade-mark in the United Kingdom.

be traced down to the seventeenth century, when it becomes lost.

Wool fat consists of the fatty acids combined with the isomeric alcohols cholesterin ($C_{26}H_{44}O$) and isocholesterin. It is therefore a mixture of ethers like ordinary fats; but cholesterin occupies the place taken by glycerine in the latter. It is not saponified so easily by alkalis as the ordinary fats are. Its saponification (separation of the fatty acids from cholesterin) occurs only after heating it with an alcoholic solution of potash, or with caustic potash itself. This stability is the reason why it does not become rancid like ordinary fats. With small quantities of borax or alkaline carbonates it forms a white emulsion. It very readily absorbs water, even up to its own weight; and this property, according to some authors, makes it more easily absorbed by the skin and mucous membranes than other unctuous substances. It has the advantage over the ordinary fats of not becoming rancid. If quite pure, wool fat is perfectly bland, but if impure, it is quite as irritating as rancid fat is. Further, it has been shown that it is impermeable to micro-organisms. It mixes well with most drugs, either in solution or powder, and the mixtures are readily absorbed by the skin. It is doubtful, however, whether absorption takes place more readily with it than with lard. It should be kept in a well-closed vessel in a cool place, otherwise water evaporates from it, and the upper layer becomes dark and hard.

Therapeutical Uses.—Its various properties combine to make wool fat an excellent ointment basis. It is the hydrous form which is almost universally employed, and it is used as a basis for all kinds of ointments, and wherever it is wished to apply a fatty substance to the skin, as in

dryness, roughness, or thickening of the integument, in seborrhœa sicca, in brittle conditions of the hair, as well as in the more serious diseases, such as eczema, prurigo, ichthyosis, &c.

Rubbed into skin, it makes the part more turgid and full, just as other animal fats do, and in this way improves its appearance.

In those cases of cutaneous disease, where rapid absorption is a disadvantage, wool fat is of course contraindicated.

EMPLASTRUM MENTHOL.

Menthol Plaster.

Mode of Preparation.—It is prepared by melting together one ounce of yellow wax and seven ounces of resin, and as the mixture cools two ounces of menthol are stirred in until dissolved. For application it is spread on some fabric.

Action and Therapeutical Uses.—When menthol is applied to the skin it is irritant like camphor, and produces a feeling of cold, followed by decided local anæsthesia, due to paralysis of the terminations of sensory nerves. Menthol plaster exerts all these actions in a more gentle and prolonged measure than pure menthol. It exercises in addition the local protective and supporting action common to such plasters.

It may be employed as a local anæsthetic and support in all superficial painful conditions, such as neuralgia, myalgia, lumbago, pleurodynia, sciatica, &c. It can also be used in itchy conditions of the skin, such as pruritus.

EUCALYPTI GUMMI.

Eucalyptus Gum; Australian or Botany Bay Kino; Red Gum.

A ruby-coloured exudation, or so-called red gum, from the bark of Eucalyptus rostrata, *Schlechtendal* (nat. ord. Myrtaceæ), and some other species. Imported from Australia.

Characters and Tests.—The exudation is at first red and jelly-like, but soon hardens and becomes brittle on exposure to the air. It is in small pieces very like kino in appearance, but scarcely so dark and shiny. The taste is very astringent, and it tinges the saliva red, but not to anything like the same extent as kino. From 80 to 90 per cent. of it is soluble in cold water, forming a neutral solution, which precipitates albumin, and gives a green precipitate or colouration with perchloride of iron. It is almost entirely soluble in rectified spirit.

It is a gum, containing large quantities of tannic acid, and a red colouring matter. (Wiesner, *Pharm. Journal*, 3 ser., ii., 1871.)

Dose.—2 to 10 grains. It can be given in powder, or suspended in mucilage, or dissolved in alcohol. It is often prescribed along with chalk and other astringents.

There are various non-official preparations, such as a tincture (1 to 4 rect. spt.) dose 20 to 40 minims, mixes with water without becoming turbid; a lozenge (1 grain in each), a suppository, and a liquid extract (1 to 3 water), dose 30 to 60 minims.

Pharmacological Action.—Its activity is due to the tannin which it contains. Locally applied, the action of

tannic acid depends on its power of precipitating albumin, the layer of tannate of albumin which is formed acting as an antiseptic and constringing protective to the underlying tissues. To this action is due its value in catarrhal inflammations, and in the treatment of discharging surfaces generally. As a styptic, locally applied, it coagulates the blood at the orifices of the bleeding vessels, and thus stops hæmorrhage. It is very improbable that any form of tannic acid exerts a remote astringent effect. It is absorbed from the alimentary canal as an alkaline tannate, or in combination with albumin, and circulates as such in the blood. Its chemical affinities are thus satisfied; it can no longer precipitate albumin or contract blood vessels, and hence can exert no astringent action. Besides, it circulates in the blood in extremely minute amount, as it is absorbed to a comparatively limited extent from the bowel, and is very rapidly excreted by the kidneys. The bowel and kidneys are the only channels for its excretion, and hence it is hardly possible that tannic acid can have an astringent action on any of the other mucous membranes, such as the bronchial. It is conceivable that it may have some action on the kidney during excretion.

Therapeutical Uses.—The applications of eucalyptus gum are those of a local astringent and styptic. It is said to be more effective than other astringents, because the gum, of which it is so largely composed, adheres with great tenacity to mucous membranes, and thus ensures their prolonged contact with the tannin. It has been used in dysentery and diarrhœa, and as a suppository or injection in relaxed conditions of the lower bowel. A solution in water (1 in 10) may be used as a styptic, as a gargle, as a vaginal douche, &c. The lozenges are slowly dissolved in the mouth

in relaxed sore throat. In powder it has been insufflated into the nose, larynx, and trachea as an astringent. In short, its applications are simply those of other vegetable astringents.

EUONYMI CORTEX.

Euonymus Bark; Wahoo Bark.

The dried root bark of Euonymus atropurpureus (nat. ord. Celastraceæ). United States.

Characters.—In quilled or curved pieces, from about $\frac{1}{12}$ to $\frac{1}{6}$ of an inch thick. The outer surface is light ash-grey in colour, with darker patches, dirty white where the epidermis has been rubbed off, soft and friable, with occasional rootlets attached. The inner surface, when free from the white wood, is pale tawny-white, and smooth. The bark breaks transversely with a finely fibrous fracture, the middle layer having a laminated appearance; longitudinally the fracture is smooth. Odour faint but characteristic; taste somewhat mucilaginous, and afterwards bitter and slightly acrid.

The chemical composition of euonymus bark is very imperfectly known, and no pure active principles have as yet been isolated from it. It contains a bitter substance and a resin, and also, it is said, a glucoside.

Preparation.—Extractum Euonymi Siccum. Dry Extract of Euonymus; Euonymin.

Mode of Preparation.—Euonymus bark in powder is exhausted thoroughly with a mixture of equal parts of rectified spirit and water. The fluid is then evaporated. So much sugar of milk is incorporated with the still fluid

extract—the actual amount having been ascertained experimentally—that the final product shall contain 80 per cent. of the dry extractive. Then evaporate over a water-bath until the mixture when cold becomes brittle. The mass is powdered and kept in a well-corked bottle. The name 'Euonymin' is inappropriate for this preparation, as the termination 'in' is reserved for active principles.

Dose.—1 to 4 grains. Given usually in pill.

Pharmacological Action.—Preparations of wahoo bark given in large doses act as violent catharties, and may cause vomiting and a good deal of prostration; but in medicinal doses they are mild, slowly-acting purgatives. Rutherford and Vignal have stated that euonymin is a powerful cholagogue; but their methods of experiment have been shown by Paschkis and others to have grave sources of fallacy. They injected the euonymin into the duodenum mixed with bile; but the bile salts are themselves very powerful hepatic stimulants, and the cholagogue action observed may have been due to them.

Schmiedeberg (*Archiv. f. expt. Path.* xvi.) states that euonymin contains a body which acts on the heart like digitalis. Its diuretic properties are probably due to this.

Therapeutical Uses.—It is given in habitual constipation, its action being very slow and gentle if the dose be small. It is chiefly prescribed in cases of so-called 'biliousness.' Biliousness is a term used to denote a set of symptoms dependent on intestinal mal-digestion. The liver or bile are not specially concerned in their causation. Any purgative will relieve the condition, and hence the value of euonymin in these cases. It is, however, much inferior both to mercurials and to podophyllum.

GELATINUM.

Gelatine.

The air-dried product of the action of boiling water on gelatigenous animal tissues, such as skin, tendons, ligaments, and bones.

Characters.—In translucent sheets or shreds. The solution in hot water is colourless and odourless, and solidifies to a jelly on cooling. Gelatine is insoluble in alcohol and ether, soluble in dilute acetic acid. Its aqueous solution is not precipitated by diluted acids, alum, acetate of lead, or perchloride of iron; it is precipitated by tannin.

It is used in preparing the Suppositoria Glycerini.

Therapeutical Uses.—Gelatine is used as a vehicle for applying medicines to the skin, such as chrysarobin, oxide of zinc, and salicylic acid. It is especially useful where it is desired to make the application in patches, as in psoriasis, being for such purposes very commonly combined with glycerine. The following formula may serve as an example: Gelatine 2, water 8. Soak twelve hours, then heat to dissolve, and add oxide of zinc 3, previously rubbed up with glycerine 6 parts. This mixture is solid, but can be readily melted by placing the vessel in which it is contained in hot water. It is applied by means of a brush, and hardens on the skin.

Mixed with glycerine in the same way, gelatine also serves as a basis for nasal, aural, and urethral bougies, for pessaries, suppositories, or for lozenges. The quantities are: Gelatine 1, water 1. Thoroughly soak, and dissolve in $3\frac{1}{2}$ parts glycerine on a water-bath. On cooling it solidifies.

GLUSIDUM.

Gluside; Saccharin; Glucusimide; Benzoyl-Sulphonic-imide.

$C_6H_4.CO.SO_2.NH.$

A sweet imide derivable from the toluene of coal tar.

Characters and Tests.—A light, white, minutely crystalline powder, having an intensely sweet taste in dilute solutions. Heated it fuses and then sublimes with partial decomposition. It is but slightly soluble in cold water or chloroform, more so in boiling water, rectified spirit, or glycerine. It is very soluble in diluted solution of ammonia; also in solution of bicarbonate of sodium with evolution of carbonic acid. The latter solution, exactly neutralised and evaporated to dryness, yields 'soluble gluside' (contains about 90 per cent.). It is not blackened by sulphuric acid. On evaporating with excess of strong solution of soda, and maintaining the residue in a state of semifusion for a few minutes, it partially forms salicylate of sodium; on cooling, dissolving in water, faintly acidulating with hydrochloric acid, and adding a few drops of solution of perchloride of iron, a reddish-brown or purplish colour is produced.

Dose.—$\frac{1}{2}$ to 2 grains or more. It may be given in glycerine. It is also used in tablets, each containing half a grain, combined with bicarbonate of sodium. Dose of soluble gluside, $\frac{1}{2}$ to 2 grains. Half a grain will sweeten a cup of tea.

Pharmacological Action.—Gluside is not poisonous, as large doses can be taken without harm, and frogs will live in a solution for months. Its chief characteristic is its

sweet taste; 1 part in 10,000 of water is sweet, while 1 in 70,000 can be detected. It requires 1 part of cane sugar in 250 of water to give a sensation of sweetness, and therefore gluside is generally estimated as having about 300 times the sweetening power of sugar, but it is not quite so strong as a rule. It is excreted unchanged in the urine, and imparts to it a sweet taste; being antiseptic, it greatly delays fermentation in this secretion.

Its prolonged use, however, is very apt to cause gastric irritation and dyspepsia; while its excretion in the saliva gives rise to a constant disagreeably sweet taste in the mouth.

Therapeutical Uses.—It can never replace sugar in our dietary, as it is not a food, and passes through the body unchanged. Wherever sugar is contraindicated, as in diabetes and obesity, it may be used as a sweetening agent. Although it thus acts as a sweet-flavouring addition to the dietary, it can in no way satisfy the craving of the system for carbohydrates.

It may also be used in pharmacy to disguise nauseous drugs.

HAMAMELIDIS CORTEX.

Hamamelis Bark; Witch Hazel Bark.

The dried bark of Hamamelis virginica (nat. ord. Hamamelaceæ). United States.

Characters.—In quills or slightly curved pieces from 2 to 6 inches long and about $\frac{1}{10}$ of an inch in thickness, covered with a silvery-grey or whitish easily-detached scaly outer bark marked with lenticels. Internally, cinnamon-brown or brownish-red, and finely striated longitudinally; transverse

fracture coarsely fibrous; tough; taste slightly astringent; no strongly marked odour.

PREPARATION.—Tinctura Hamamelidis, Tincture of Hamamelis, 1 in 10 of proof spirit.

Dose.—5 to 60 minims.

HAMAMELIDIS FOLIA.

Hamamelis Leaves; Witch Hazel Leaves.

The dried leaves of Hamamelis virginica.

Characters.—Shortly petiolate, from 4 to 6 inches long, oval, obtuse, wavy-crenate, narrowed below, oblique and slightly heart-shaped at base, pinnately veined, veins prominent on the under surface, nearly smooth. The leaves have a slight tea-like odour, and an astringent and bitter taste.

PREPARATION.—Extractum Hamamelidis Liquidum. Liquid Extract of Hamamelis.

Is made by exhausting hamamelis leaves with rectified spirit and distilled water, and concentrating until the strength is such that one part of the fluid extract equals one part of the crude drug.

Dose.—2 to 5 minims.

PREPARATION.—Unguentum Hamamelidis. Ointment of Hamamelis.

It is made by mixing one fluid part of the liquid extract with nine parts of simple ointment.

Chemical Composition.—The bark contains about 7 per cent. of tannin, resin, sugar, mucilage, and the ordinary constituents of woody fibre. No alkaloid or glucoside has been found in it or any part of the plant.

Pharmacological Action.—Given even in large doses, preparations of hamamelis exert no apparent effects on the animal organism. Wood and Marshall, and Guy, state that it has no poisonous action. Bartholow asserts that whatever action it may have is due to the tannin. This can hardly be the case, however, as a preparation called hazeline, obtained by distillation, and therefore containing only volatile substances, is asserted to be equally active.

Therapeutical Uses.—The preparations are used locally as styptics and astringents in all kinds of passive hæmorrhage. They may be applied on lint or cotton wool, or as a lotion, or ointment. Internally it is given in hæmorrhages, as in epistaxis, hæmoptysis, menorrhagia, &c. Locally applied, and given by the stomach, it is said to be especially valuable in bleeding piles.

HOMATROPINÆ HYDROBROMAS.

Hydrobromate of Homatropine.

$C_{16}H_{21}NO_3,HBr$.

The hydrobromate of an alkaloid, prepared from tropine.

Mode of Preparation.—Tropine ($C_8H_{14}NOH$) is obtained from atropine. On heating the former with oxytoluic acid in presence of hydrochloric acid, homatropine (oxytoluyl-tropeine) is formed ($C_8H_{14}NO.CO.CHOH.C_6H_5$), oxytoluic acid replacing one atom of hydrogen in the tropine.

Characters and Tests.—In crystalline powder, soluble in 6 parts of cold water, and in 133 of ethylic alcohol. The dilute aqueous solution powerfully dilates the pupil. On ignition it leaves no residue. If 2 minims of chloroform be shaken with 10 minims of a 10 per cent. aqueous solution, and chlorine water be cautiously added, the chloroform will become brownish. A 2 per cent. aqueous solution is not precipitated by the cautious addition of solution of ammonia previously diluted with twice its volume of water. About a tenth of a grain moistened with 2 minims of nitric acid, and evaporated to dryness on the water-bath, yields a residue which is coloured yellow by an alcoholic solution of potash. If about a tenth of a grain be dissolved in a little water, and the solution made alkaline with ammonia, and shaken with chloroform, the separated chloroform will leave on evaporation a residue which will turn yellow, and finally brick-red, when warmed with about 15 minims of a solution of 2 grains of perchloride of mercury in 100 minims of proof spirit.

Dose.—$\frac{1}{80}$ to $\frac{1}{20}$ grain.

Pharmacological Action.—The pharmacological action of homatropine is almost identical with that of atropine, but it is not so powerful. It also slows the heart instead of quickening it, this being most probably due to a stimulating action on the vagi nerves, by which their cardio-inhibitory effect is temporarily increased.

Homatropine has been used chiefly to dilate the pupil. The action is feebler and more transient than that of atropine. When dilatation is desired simply for ophthalmoscopic examination, the installation of a drop or two of a solution of 2 to 4 grains to the ounce of water is sufficient.

The pupil begins to dilate in from about 10 to 20 minutes, the dilatation passing off in a period varying from a few hours to one and a half or two days. With atropine, on the other hand, the dilatation usually lasts about four days. The power of accommodation is also paralysed just as with atropine.

Therapeutical Uses.—Homatropine may be used wherever it is wished to dilate the pupil or keep it dilated. For the latter purpose more frequent application is necessary than with atropine. It is a more convenient and safer mydriatic than the latter, because vision becomes normal in less time after its use, and it is much less apt to produce general systemic effects if absorbed. Gelatine discs, containing $\frac{1}{5000}$ grain, are also used. Homatropine has been given in the sweating of phthisis, but has not shown itself so effective as atropine.

HYDRASTIS RHIZOMA.

Hydrastis Rhizome; Golden Seal.

The dried rhizome and rootlets of Hydrastis canadensis (nat. ord. Ranunculaceæ). North America.

Characters.—The rhizome is simple or branched, from half an inch to an inch and a half long, and from one-eighth to one-half inch thick. It is twisted and knotted, and has an irregular appearance. The upper surface has irregular projections, which are terminated by scars produced by the decay of aërial stems. There are numerous rootlets. The rhizome is yellowish-brown, becoming darker by age. It

has a clean resinous fracture of a brownish-yellow colour, with a bright yellow centre.

PREPARATIONS.—Extractum Hydrastis Liquidum, Liquid Extract of Hydrastis, 1 part in 1 fluid part.

The powdered rhizome is exhausted with a mixture of equal parts of rectified spirit and water. The fluid is then evaporated to the proper strength.

Dose.—5 to 30 minims.

Tinctura Hydrastis, Tincture of Hydrastis, 1 part in 10 fluid parts of proof spirit.

Dose.—20 minims to 1 fluid drachm.

Pharmacological Action. — The activity of hydrastis depends on the presence of two alkaloids—berberine and hydrastine.

When berberine is given to man in small doses (under 5 grains) its action is simply that of a bitter tonic. Twenty grains have been taken without any injurious effects other than slight diarrhœa. In the lower animals likewise small doses produce no outward symptoms. Toxic doses, however, exercise their action specially on the central nervous system. The automatic motor centres are first depressed, then paralysed, the paralysis extending also to the spinal cord. The sensory centres are much less markedly affected. In rabbits 7 to 15 grains caused death after some hours with trembling, dyspnœa, and paralysis. In dogs there were tremblings, thirst, and diarrhœa.

On the heart and circulation it is important to observe that small doses have absolutely no action. Large doses, however, depress the heart and circulation, the pulse waves

becoming weak, small, and frequent. The increased rapidity of the heart is due to depression or paralysis of the vagus terminations in the heart. Finally, berberine causes no contraction of the arterioles. (Marfori, *Archiv. f. expt. Path.* xxvii. 1890.)

Hydrastine in small doses also acts as a bitter tonic. In the lower animals large doses cause convulsions like those of strychnine poisoning, due to stimulation of the spinal cord, and preceded by incoordination of movement and dyspnœa. Between the tetanic attacks there are periods of exhaustion, but the slightest stimulation suffices to call forth a spasm. Death occurs either in convulsions or with symptoms of complete exhaustion. It is excreted unchanged in the urine.

Great interest attaches to its action on the circulatory system. Small doses raise the blood-pressure very markedly, and at the same time there is powerful contraction of the arterioles. This is due chiefly to stimulation of the vasomotor centre in the medulla. Large doses greatly depress the heart's action and blood-pressure, but the arterioles remain contracted. The pulse-rate is increased from stimulation of the accelerator nerves of the heart.

Hydrastine is also said to have an ecbolic action. It causes contractions in the non-pregnant uterus and abortion in pregnant rabbits.

Therapeutical Uses.—Hydrastis preparations are used as bitter tonics in atonic dyspepsia, in catarrh of the stomach, duodenum, and bile-ducts. In chronic constipation, associated with intestinal catarrh, it acts well but gradually. As an injection in the second stage of gonorrhœa (10 to 20 minims fluid extract to an ounce of water), in leucorrhœa and other catarrhal inflammations, it is said to act well. It

has also been given internally in catarrh of the bladder with good results.

Hydrastis has been very largely used in gynæcological practice. In congestions of the uterus and its appendages, in menorrhagia, metrorrhagia, and congestive dysmenorrhœa, it has been used for some years, and is very favourably reported on by Schatz and others. (*Cbl. f. Gynäkologie*, 1883. *Berlin. klin. Wochenschr*, 1886.) Schatz prefers it to ergot in many cases, as, in his opinion, it does not cause contraction of the uterine muscle, but simply contracts the blood vessels. It has also proved of service in hæmoptysis.

Under the name of hydrastin there is sold a substance consisting of hydrastine, berberine, and a resin. Cholagogue properties have been ascribed to it, but it probably acts simply as a bitter tonic.

The therapeutical value of hydrastis as a bitter tonic depends apparently on much the same properties as those of strychnine. It is antifermentative, it stimulates secretion and peristalsis, and at the same time heightens the activity of the central nervous system. In catarrhal states it contracts the blood vessels, and probably in this way tones up the mucous membrane.

In congestions and hæmorrhages the hydrastine alone acts, as berberine has no contracting effect on the arterioles. Marfori has shown that the frequent administration of small doses keeps the spleen in a condition of constant contraction.

Like most bitter substances, these alkaloids act as antiperiodics, but are very much inferior to quinine in this respect.

LIQUOR COCAINÆ HYDROCHLORATIS.

Solution of Hydrochlorate of Cocaine.

Mode of Preparation.—It is prepared by dissolving 33 grains (or 100 parts) of hydrochlorate of cocaine, and $\frac{1}{2}$ grain (or $1\frac{1}{2}$ parts) of salicylic acid, in 6 fluid drachms (or 1000 fluid parts) of distilled water.

Dose.—2 to 10 minims (about $\frac{1}{6}$ to 1 grain).

Characters and Tests.—This is a 10 per cent. solution of hydrochlorate of cocaine. The salicylic acid is added to preserve it, as the alkaloid is very apt to decompose when kept dissolved simply in water. The tests are those of cocaine hydrochlorate.

Action and Therapeutical Uses.—This solution is intended for application to mucous membranes and for subcutaneous injection. As is well known, cocaine has no action on the unbroken skin. For ophthalmic purposes a 2 to 4 per cent. solution is commonly employed; hence the officinal liquor would require to be diluted to $2\frac{1}{2}$ or 5 times its original bulk. A few drops of a 4 per cent. solution applied to the cornea cause some anæsthesia in two to six minutes, which reaches its maximum in ten to fifteen minutes, and subsides entirely in about half an hour. The times vary, however, especially with different strengths of solution. In about fifteen minutes after the application the pupil begins to dilate; the dilatation reaches its height in about one hour, is never maximal and gradually subsides in a few hours. During it, the pupil reacts promptly to light, but there is slight paralysis of accommodation. More frequent applications or stronger solutions are necessary to paralyse sensation in the deeper parts of the eye.

The application of the solution causes local anæmia. The anæsthesia is due to paralysis of the terminations of sensory nerves, and not to the anæmia, as it can be induced in frogs in which the blood has been replaced by normal saline solution. The mucous membranes of the nose, throat, larynx, vagina, and rectum require 10 or even 20 per cent. solutions for the production of complete anæsthesia.

A quarter of a grain to one grain injected subcutaneously will produce local anæsthesia in about two to five minutes. The extent of the anæsthetised zone varies, but is about one or two inches usually. In about a quarter of an hour the anæsthesia begins to disappear.

It is unnecessary to indicate at length the therapeutical uses of cocaine as a local anæsthetic.

LIQUOR MORPHINÆ SULPHATIS.

Solution of Sulphate of Morphine.

Mode of Preparation. — It is prepared by dissolving 35 grains (or 1 part) of sulphate of morphine in 2 fluid ounces (or 25 fluid parts) of rectified spirit, and adding distilled water up to 8 fluid ounces (or up to 100 fluid parts).

Dose.—10 to 60 minims.

Characters.—It is a colourless, neutral solution, giving the chemical tests for sulphate of morphine. It is a 1 per cent. solution, of the same strength as the officinal Liquor Morphinæ Hydrochloratis and Liquor Morphinæ Acetatis. Both of these, however, contain free acid to assist in dissolving the morphine salts.

Action and Uses.—Its action and uses are the same as those of the other solutions of morphine salts.

LIQUOR TRINITRINÆ.

Solution of Trinitrin; Liquor Nitroglycerini; Solution of Nitroglycerine; Liquor Glonoini; Solution of Glonoin.

This is a 1 per cent. solution of nitroglycerine in rectified spirit. It is colourless, and has a specific gravity of 0·884.

Dose.—$\frac{1}{2}$ to 2 minims.

Pharmacological Action.—Nitroglycerine is nitrate of glyceryl ($C_3H_5(NO_3)_3$).

When it is administered *subcutaneously* or *intravenously* to frogs and mammals, tetanus and clonic convulsions are produced. These are due to an action on the spinal cord and medulla, and are the effects of undecomposed nitroglycerine. From the alimentary canal it cannot, owing to its insolubility, be absorbed with sufficient rapidity to cause convulsions. When given by the mouth its action is wholly different, and is essentially that of a nitrite. In contact with alkalis nitroglycerine is decomposed, furnishing nascent nitrous acid. This decomposition takes place in the intestine and in the blood, the drug circulating in the blood, and being found in the urine, partly as nitrites and partly as undecomposed nitroglycerine. When given to man in medicinal doses, its action differs in no way from that of nitrite of sodium (*q.v.*). It is, however, a more powerful substance, as the dose indicates, and its action is more prolonged. The latter circumstance is due to its very slow absorption. On different individuals, and on the same individual at different times according to his state of health, nitroglycerine acts with very varying degrees of severity. A single drop of a 1 per cent. solution will usually cause,

in a few minutes, giddiness, violent throbbing in the head, rapid cardiac action, and diminished arterial tension. There is often violent headache lasting for some hours, and nausea and even fainting may be produced. Large doses simply cause the symptoms of nitrite poisoning.

Therapeutical Uses. — It was strongly recommended by Dr. Murrell (1879) as a remedy in angina pectoris, and since then has been largely used with excellent results. Dr. Murrell gives it along with spirit of chloroform, tincture of capsicum, and peppermint water. Its action on the arterial tension generally begins in one and a half or two minutes, and lasts for one or several hours, according to the size of the dose and the susceptibility of the individual. The dose must be graded according to its effects on the arterial tension, some persons being able to take the enormous quantity of 100 minims eight times daily, while others are profoundly affected by a single drop. As with other nitrites, marked tolerance often becomes established.

It is also used as a diuretic in Bright's disease, and in asthma and bronchitic asthma, just as nitrite of sodium is. It has been given as a remedy in neuralgia, and also subcutaneously in severe syncope.

MAGNESII SULPHAS EFFERVESCENS.

Effervescent Sulphate of Magnesium; Effervescent Epsom Salt.

Take of

Sulphate of Magnesium, in crystals	25 ounces	or	100 parts
Bicarbonate of Sodium, in powder	18 ounces	,,	72 parts
Tartaric Acid, in powder .	9½ ounces	,,	38 parts
Citric Acid, in powder . .	6¼ ounces	,,	25 parts
Refined Sugar, in powder .	5¼ ounces	,,	21 parts
The final product should weigh about	50 ounces	,,	200 parts

The sulphate of magnesium is dried at about 130° F. (54°·4 C.) until it has lost nearly one-fourth of its weight; powder and mix it with the sugar and then with the other ingredients. Place the mixture in a dish and heat to between 200° and 220° F. (93°·3 and 104°·4 C.), and when the particles of the powder begin to aggregate, stir them constantly until they assume a granular form; then, by means of sieves, separate the granules of uniform and most convenient size, and preserve in stoppered bottles.

Dose.—$\frac{1}{4}$ to 1 ounce, in water.

Therapeutical Uses.—It forms a pleasant saline purgative containing sulphate of magnesium and citrate and tartrate of sodium.

MISTURA OLEI RICINI.

Castor Oil Mixture

Is made by taking of

Castor Oil	6 fl. drachms	or	180 fl. parts
Oil of Lemon	10 minims	„	5 fl. parts
Oil of Cloves	2 minims	„	1 fl. part
Syrup	$1\frac{1}{2}$ fl. drachms	„	45 fl. parts
Solution of Potash	1 fl. drachm	„	30 fl. parts
Orange Flower Water sufficient to produce	2 fl. ounces	„	480 fl. parts

Mix the oils in a mortar, then incorporate one-third of the solution of potash, and afterwards the syrup, then an additional third of the solution of potash, then, gradually, half of the orange flower water, the remainder of the solution of potash, and, lastly, sufficient orange flower water to produce the required volume.

Dose.—½ to 2 fluid ounces. Each ounce contains three drachms of castor oil.

Therapeutical Uses.—This is an emulsion of castor oil, by means of which its taste is disguised and rendered pleasant. The mixture, however, contains far too large a quantity of essential oils, and there are several better emulsions in common use.

OLEUM CADINUM.

Oil of Cade; Huile de Cade; Juniper Tar Oil.

An empyreumatic oily liquid obtained by the destructive distillation of the woody portions of Juniperus Oxycedrus (nat. ord. Coniferæ), and some other species.

Characters.—It is a dark reddish-brown or nearly black, more or less viscid oily liquid, with a not unpleasant empyreumatic odour and an aromatic, bitter, and acrid taste. Specific gravity about 0·99. It is soluble in ether and chloroform; partially soluble in cold, almost wholly in hot rectified spirit. In water it is very slightly soluble. The filtered aqueous solution is almost colourless, and possesses an acid reaction. Chemically it does not differ materially from common tar, and contains creasote, phenol, toluol, and a number of other products of the destructive distillation of the wood.

Action and Therapeutical Uses.—Its action is similar to that of tar, but its odour is more agreeable, and it is cleaner. It is also thought to be more efficacious, but probably such is not the case. It is antiseptic, and when applied to the skin or mucous membranes causes a good deal of hyperæmia, redness, and local irritation. If the skin be tender it may cause considerable pain.

It is used in chronic skin diseases where the skin is thickened and infiltrated, as in psoriasis, eczema, and prurigo.

In very chronic cases one may begin with an application of the strength of one part of oil of cade to from four to ten of ointment basis, the strength being increased or decreased if necessary.

It may be made up into an ointment with lard, vaseline, a mixture of lard and wax, &c. Equal parts of oil of cade, soft soap, and rectified spirit, make a very good preparation for painting on the skin.

PARALDEHYDUM.

Paraldehyde.

$C_6H_{12}O_3$.

A product of the polymerisation of aldehyde by various acids or salts. Aldehyde is C_2H_4O, paraldehyde $(C_2H_4O)_3$.

Characters and Tests.—It is a clear, colourless liquid, having a characteristic ethereal odour and afterwards a cooling taste. Sp. gr. 0·998; boiling point 255°·2 F. (124° C.). It begins to congeal to a clear crystalline mass at 50° F. (10° C.). One part dissolves in ten parts of water at 60° F. (15°·5 C.); it is less soluble in hot water. It is miscible in all proportions with rectified spirit or with ether. An aqueous solution should have a neutral reaction. It affords no colouration on standing for two hours mixed with a solution of potash or soda, nor any precipitate with a solution of either chloride of barium or nitrate of silver.

Dose.—$\frac{1}{2}$ to $1\frac{1}{2}$ fluid drachms. It may be given in capsule, or in simple or flavoured syrups, or in spirits.

Pharmacological Action.—Paraldehyde was first investigated by Cervello (*Archiv. f. expt. Path.* 1882). It is very rapidly absorbed, and produces hypnotic effects in animals

in a few minutes. When given to man it causes a slight condition of intoxication, followed by a sleep which lasts several hours. On awakening there are no unpleasant after-effects, except a disagreeable odour in the breath. The odour is that of paraldehyde, which is excreted by the lungs. After taking it by the stomach, similar eructations are very frequent and rather disagreeable. It slightly lowers the blood pressure from dilatation of the arteries, but has no depressing effect on the circulation. Free perspiration is apt to be induced, and it may cause a good deal of dyspepsia by irritating the stomach.

Therapeutical Uses.— Paraldehyde is a very useful hypnotic, and, in spite of the drawbacks mentioned above, has steadily grown in favour since its introduction. It has been largely used and favourably reported on in asylum practice. It may be used in all kinds of insomnia, but, like all the newer hypnotics, is much inferior to opium if pain be present.

PHENACETINUM.

Phenacetin; Acetphenetidin; Para-acetphenetidin.

$$C_{10}H_{13}NO_2.$$

A crystalline substance produced by the action of glacial acetic acid on para-phenetidin, a body obtained from phenol.

Para-phenetidin is the ethyl-ether of amidophenol. Its chemical relationships are as follows: Phenol has the formula C_6H_5OH; amidophenol is $C_6H_4{<}^{OH}_{NH_2}$; (para)-phenetidin is $C_6H_4{<}^{OC_2H_5}_{NH_2}$; while (para)-acetphenetidin is

$$C_6H_4{<}^{OC_2H_5}_{NH(C_2H_3O)}.$$

The successive alterations in chemical structure are produced by the substitution of hydrogen atoms by radicals. If we write the formula of acetanilide thus—$C_6H_4 < {}^{H}_{NH(C_2H_3O)}$, its close chemical relationship to acetphenetidin (phenacetin) is at once apparent.

Characters and Tests.—It is in colourless, tasteless, inodorous, scaly, glistening crystals. Sparingly soluble in cold water; more freely in boiling water, and in about sixteen fluid parts of rectified spirit. Melting point 275° F. (135° C.). Heated with free access of air it burns, leaving no residue. Sulphuric acid dissolves it without colour. One grain boiled with twenty minims of hydrochloric acid for about half a minute yields a liquid which, diluted with ten times its volume of water, cooled and filtered, assumes a deep red colouration on the addition of solution of chromic acid. A cold saturated aqueous solution should not become turbid on the addition of bromine water. A mixture of five grains of phenacetin with two fluid drachms of solution of potash, boiled, should yield no unpleasant odour when again boiled after the addition of five drops of chloroform (absence of acetanilide).

Dose.—5 to 10 grains. It may be given in powder, or suspended in a little water, in cachets or capsules, or in alcoholic solutions.

Pharmacological Action.—Phenacetin was introduced into medicine by Hinsberg and Kast. (*Cbl. f. d. med. Wiss.* 1887.) Its pharmacological action is essentially the same as that of acetanilide, to which it is so closely allied chemically. In man small doses have no appreciable action unless fever or pain be present. When toxic doses are given, the effects

on the nervous system, blood, circulation, and urine are the same as those of acetanilide. In animals large doses greatly depress the central nervous system. In healthy men, in 15 to 30 grain doses, it causes fatigue, yawning, and somnolence, often accompanied by vertigo, shivering, and general malaise.

Therapeutical Uses.—It has been employed as an antipyretic and analgesic in the same way and in the same cases as acetanilide and phenazone. Hoppe found that, in doses of 1½ to 3 grains in children, and of 4 to 7 or 10 grains in adults, it acted as a powerful antipyretic, without as a rule causing any unpleasant effects. The fall of temperature begins usually in about half an hour, and continues for three to eight hours. In cachectic and phthisical patients it should be used with caution.

For analgesic purposes the dose should be somewhat larger.

Unpleasant Effects.—These are much the same as with acetanilide. It is extremely well borne by the stomach, and, so far as one can judge, the weight of our present experience seems to prove that unpleasant effects are much less common than with acetanilide or phenazone. (*Falk. Therap. Monatshefte*, 1890.)

PHENAZONUM.

Phenazone; Phenyl-dimethyl-pyrazolone; Antipyrine; Analgesine.

$C_{11}H_{12}N_2O$ $C_6H_5(CH_3)_2C_3HN_2O$.

A crystalline substance obtainable from phenylhydrazine by heating it with aceto-acetic ether.

Phenyl-hydrazine is related to phenol through the following stages. Phenol is $C_6H_5 \cdot OH$, aniline is $C_6H_5 \cdot NH_2$, diazobenzol is $C_6H_5 - N = N - OH$, and phenylhydrazin is $C_6H_5N - NH_2$ (with H). The chemical reactions which take place in the manufacture of phenazone are too complicated to be given in detail.

Characters and Tests.—It is in colourless, odourless, scaly crystals with a somewhat bitter taste, freely soluble in water (1 in 1), rectified spirit and chloroform; less soluble in ether. Ignited with free access of air, it burns, leaving no residue. It melts at 230° F. (110° C.). Its aqueous solution is neutral in reaction, although it is an alkaloid and unites directly with acids to form salts. One grain of nitrite of sodium and two fluid drachms of a one per cent. aqueous solution of phenazone yield a nearly colourless liquid which turns deep green on the addition of ten minims of diluted sulphuric acid; free nitrous acid gives a green colour, or in concentrated solution green crystals. A one per cent. aqueous solution mixed with an equal volume of nitric acid assumes a yellow colour passing to crimson on warming. Solution of perchloride of iron produces in a very dilute aqueous solution a deep red colour, which is nearly discharged by excess of diluted sulphuric acid.

The name antipyrine is a registered trade-mark in this country and proprietary, hence it will be preferable in the future to use the term phenazone. For the same reason, and on account of its analgesic properties, it has been called analgesine in France. Phenyl-dimethyl-pyrazolone is in accordance with chemical nomenclature. Antipyrine was discovered by Knorr, of Munich, and the first experiments as to its physiological action were made by Professor Filehne. (*Ztschr. für klin. Med.*, 1884.)

Dose.—3 to 20 grains. It can be given in powder, in watery solution, or in flavoured solution, in cachets, capsules, or tabloids. Hypodermically or per rectum it can be given in watery solution, but subcutaneous injection is very painful.

It is incompatible with spirit of nitrous ether and with salicylate of sodium, forming in the one case green crystals and in the other an oily liquid.

Pharmacological Action. — Moderate doses given to a healthy man cause no symptoms. If about thirty grains are administered there may be some singing in the ears, slight nausea, and an absolutely unimportant fall of temperature (one or more tenths of one degree F.). After larger doses (up to 60 grains) vomiting is very apt to occur with giddiness, and a distressed feeling in the head. Its action is occasionally capricious, however, as much smaller doses may produce these symptoms, and in addition cyanosis, depression, and disturbance of the heart and circulation.

If pain or fever be present, the former disappears wholly or partially, and the temperature falls. Phenazone is rapidly absorbed, the reduction of temperature begins usually in ten to twenty minutes, and in about half an hour after administration there is generally profuse perspiration. The fall is not due to this, as reduction of temperature may occur without much perspiration, and also in cases where atropine has been previously given. It lasts from two to sixteen hours, and the subsequent rise is usually gradual; it may however be sudden and may be accompanied by a feeling of chilliness or by rigors. There is diminished heat-production, the cause of which is not very clearly understood. It may result from an action on the heat centres, or phenazone, being a general protoplasmic poison, may simply reduce the activity of all

the chemical processes in the body, and thus lessen heat-production.

Small doses stimulate the nervous system in mammals, and cause even convulsions in frogs. The brain, cord, and medulla seem all to be affected. Larger doses depress the whole nervous system, and may induce complete loss of reflexes. The grey matter of the spinal cord especially has its conducting power diminished, and there is in consequence more or less complete sensory paralysis. The power of the cerebral cortex to receive impressions is also lessened. The functions of the white nerve-matter are not so markedly interfered with, but the direct application of a solution of antipyrine to a mixed nerve paralyses it.

Small doses contract the arterioles apparently by stimulating the vasomotor centre, and thus raise the blood-pressure; but large amounts distinctly depress the circulation, the vessels dilate, and blood-pressure falls. The heart muscle is also directly weakened, as phenazone is a muscle poison. Respiration is not affected by small doses, but after larger ones it is slowed.

On bodily metabolism phenazone exercises a very decided action, even in the non-febrile condition. The excretion of urea is notably diminished, and hence chemical change must be much less active. In fever the nitrogenous elimination is reduced, both directly, and also indirectly by the fall of temperature.

The blood is not altered as a rule, but after large doses there may be formation of methæmoglobin. This accounts for the frequently observed cyanosis. According to Lépine the number of red corpuscles is not lessened.

Phenazone is eliminated chiefly in the urine, and very rapidly. It does not notably affect the amount. It may be detected within three-quarters of an hour after administra-

tion, and after large doses excretion goes on up to two or even four days, but the greater part leaves the body during the first twelve or eighteen hours. To test for it in the urine a solution of iodine in iodide of potassium may be used. A small quantity of urine is acidified with a few drops of sulphuric acid, when, on adding the reagent, a reddish-brown precipitate is obtained. Another method is to add a few drops of solution of ferric chloride to the urine, when a precipitate of phosphates is obtained. This clears up on heating, leaving a dark reddish-brown colouration.

Phenazone is by no means a powerful germicide, a 3 per cent. solution being required to kill the commoner organisms. Applied to the eye or to raw surfaces it causes severe pain and irritation.

Therapeutical Uses.—As an antipyretic, it is used to reduce temperature in pneumonia, typhoid, typhus, scarlet, and other fevers. As a rule, it acts promptly and efficaciously in reducing the temperature, but exerts no specific action in controlling the course of the disease. A comparatively small dose, such as 10 or 15 grains, is often quite sufficient; but a by no means uncommon practice is to give 30, 30 and 15 grains at intervals of an hour. The risk of the production of great depression should never be forgotten, and hence it is as well to begin with a moderate dose to test the patient's susceptibility. Collapse has most frequently occurred in the anæmic and in sthenic fevers. In chronic fever and in hectic fever it has also been used with good results. The smallest dose necessary to obtain the desired effect should be used, and if sweating be produced it can be controlled by atropine. Children of from 1 to 12 years of age may get from 2 to 7 grain doses. If it cause nausea or sickness it can be given per rectum.

As an antiperiodic it is of no value. It reduces temperature in malarial just as in other fevers, but it has no power to prevent the paroxysms.

In acute rheumatism antipyrine has been said to have a specific action. It certainly controls the temperature and lessens the pain, but its action is inferior to that of the salicylates, and most probably is in no way specific. It has been largely used in influenza, coryza, tonsillitis, and similar diseases, where it greatly conduces to the patient's comfort by lowering the temperature and deadening the sensory nervous system.

As an analgesic phenazone is now very extensively used. It relieves pain chiefly by depressing sensory conduction in the cord. There is no narcosis, and the patient can go about as usual. If the dose be not too large there are no effects except the disappearance of pain. Germain Sée has stated it as his experience that 45 to 90 grains given during twenty-four hours will control most forms of pain. It is given with satisfactory effects in all kinds of neuralgia, in myalgia, chronic and acute rheumatism and tabetic pains. It has proved less successful in malignant disease, renal and biliary colic, and the graver forms of organic lesion, in which pain is often a prominent symptom.

It is of particular value in migraine, and headache, more especially if of nervous origin. In dysmenorrhœa, and in the after-pains of labour, it lessens the patient's suffering. Pain from periostitis, toothache, and other inflammations may be greatly relieved by it. In such cases it can be injected locally, but, as has been before pointed out, this is in itself an extremely painful proceeding from the local irritation caused at first. It has been also used in gout, and is said to relieve the symptoms independently of its action on pain. It may induce sleep when insomnia is dependent on general

nervous irritability or on pain. As a sedative to the nervous system in asthma, chorea, and whooping cough, it has been recommended by some writers. In diabetes very excellent results have been obtained by the use of phenazone. The excretion of sugar is greatly diminished and the amount of urine lessened. In France, where this treatment was first used, it was recommended to give 45 grains per day, but smaller doses sometimes act equally well. Improvement takes place even when the diet is not strictly diabetic. Phenazone has also been used in epilepsy; a few cases seem to do fairly well.

Dangers and Disagreeable Effects.—When phenazone was first introduced it was said to be absolutely safe, and to have no unpleasant subordinate actions. Further experience has not confirmed this, however, as few drugs have shown such an array of unexpected effects.

Slight degrees of poisoning, consisting in disturbance of the circulation and respiration, with cyanosis and impaired sensation, have often been reported.

More or less disturbance of digestion, with epigastric pain, nausea, and vomiting, is an extremely frequent complication. These can often be avoided by administration per rectum, but not in every case.

Even small doses are often badly borne by the phthisical, anæmic, and weakly. In typhoid, diphtheria, and similar cases the depression is sometimes alarming. Very profuse sweating may be induced, especially in hectic subjects. The temperature sometimes falls below normal, and in such cases there is always a feeling of fatigue, and sometimes great collapse. When the temperature begins to rise it may do so very rapidly with rigors.

A common and very unpleasant result of phenazone is the

production of skin eruptions. Usually the eruption is papular, sometimes there is diffuse redness, sometimes it is urticaria-like, purpuric, or even bullous. It may be widely diffused or local, and may be followed, if severe, by desquamation and a good deal of constitutional disturbance. Eruptions on mucous membranes, and local œdemas of the skin, and of different parts of the respiratory tract, have all been reported, and are consequences of vasomotor disturbance.

It sometimes acts very distinctly on the cerebrum, and may cause headache, vertigo, apathy, yawning and sleepiness, loss of memory, confusion of words and ideas, and some deafness. Coma and convulsions have also been noted, and, very rarely, excitement. Albuminuria has been found after large doses, especially in diabetes, and its long-continued use is said to dispose to hæmorrhage.

In spite of such a formidable list, phenazone has comparatively rarely caused death. The condition of the patient rather than the size of the dose seems to determine the fatal issue, as very large amounts have often been well borne, while small ones have proved fatal.

PICROTOXINUM.

Picrotoxin.

A crystalline active principle obtained from the seeds of Anamirta paniculata (nat. ord. Menispermaceæ) by exhaustion with alcohol, evaporation, and purification. The dried fruit of the plant is known as Cocculus Indicus.

Characters and Tests.—It is in colourless, inodorous, prismatic crystals, having a bitter taste. It melts at 378° F.

(192°·2 C.). It is soluble in 330 parts of cold water, in 35 parts boiling water, in 3 of boiling, and 13 of cold rectified spirit. It is soluble in 10 parts of solution of potash, and the resulting liquid, on boiling, immediately reduces Fehling's solution. It burns without leaving any ash. Its aqueous solution is not precipitated by solutions of perchloride of mercury, perchloride of platinum, or tannic acid. It dissolves in sulphuric acid with a saffron-yellow colour. It is a glucoside, and has the formula $C_{30}H_{34}O_{13}$ (?).

Dose.—$\frac{1}{100}$ to $\frac{1}{30}$ grain. It is best given in pill, or subcutaneously dissolved in water.

Pharmacological Action.—When picrotoxin is administered to animals in large dose, there occur drowsiness, slight stupor, and disordered gait. These symptoms are soon followed, if the dose be large enough, by irregular clonic spasms which rapidly pass into convulsions resembling epileptic seizures. Swimming movements, irregular movements of the limbs, and rolling movements are also observed. These phenomena are most probably due to a stimulant action on the medulla oblongata, although certain observers are of opinion that the motor areas in the cortex are specially acted upon. Vomiting, salivation, and diarrhœa are seen in dogs; peristalsis is stimulated, and the secretions generally are augmented. Death occurs from paralysis of respiration during the convulsions. The circulation and heart are but slightly affected directly, but alter a good deal during the seizures as compared with the intervals of rest. The peripheral nerves and muscles remain intact. Elimination of the drug occurs chiefly by the kidneys.

Therapeutical Uses.—The applications of picrotoxin have no apparent connection with its physiological action. It

was used by Dr. Murrell (*Practitioner*, ii., 1874) as a remedy in the night sweats of phthisis. The effects of one dose last several days.

It has been given also in chorea and epilepsy, but with very doubtful success.

As an ointment (10 grains to the ounce) it has been used to destroy pediculi. It is, however, rather a dangerous application, and there are many other remedies, quite as efficient and much safer. Cocculus Indicus, or picrotoxin, are sometimes fraudulently added to beer instead of hops. The liquor is thereby rendered much more intoxicating and apparently stronger.

PILULA FERRI.

Iron Pill; Blaud's Pill.

This pill is ordered to be made as follows:

Sulphate of Iron . .	60 grains	or 120 parts
Carbonate of Potassium .	36 „	„ 72 „
Refined Sugar . .	12 „	„ 24 „
Tragacanth, in powder .	4 „	„ 8 „
Glycerine . . .	2½ minims	„ 4½ fl. parts
Distilled Water . .	a sufficiency.	

The sulphate of iron is mixed intimately in a mortar with the sugar and tragacanth; the carbonate of potassium is finely powdered in another mortar, and thoroughly mixed with the glycerine. The latter is then added to the former, and the mass thoroughly beaten up until it becomes green. If necessary add sufficient water to impart a pilular consistence. Divide into five-grain pills. Each pill contains about one grain of carbonate of iron.

Dose.—1 to 4 pills.

Therapeutical Uses.—Blaud's pill is a form for administering freshly-prepared carbonate of iron. The carbonate of iron is a ferrous salt, insoluble in water, unirritating, and not astringent. The form in which it is made up, and the presence of the sugar, tend to prevent it being oxidised to ferric oxide. It is used largely in chlorosis, and in cases where the milder iron preparations are indicated.

PULVIS SODÆ TARTARATÆ EFFERVESCENS.

Effervescent Tartarated Soda Powder; Seidlitz Powder.

Tartarated soda (120 grains in dry powder) and bicarbonate of sodium (40 grains in dry powder) are mixed together and wrapped in blue paper; tartaric acid (38 grains) is wrapped in white paper.

Dose.—The former powder is dissolved in nearly half a pint of cold or warm water, and the latter powder then added.

This preparation has been made official, as it was thought desirable to have a uniform formula for Seidlitz Powder. It is an effervescent saline purgative.

SODII BENZOAS.

Benzoate of Sodium.

$NaC_7H_5O_2$.

Mode of Preparation.—It may be obtained by neutralising benzoic acid with solution of carbonate of sodium and evaporating to dryness.

Characters and Tests.—A white amorphous or obscurely crystalline powder, inodorous or with a faint benzoic smell, taste sweetish alkaline, reaction slightly alkaline. It is very soluble in water; soluble in twenty-four parts of cold, and in twelve of boiling rectified spirit. An aqueous solution gives a dense yellowish precipitate on the addition of a ferric salt. When a quantity weighing 10 grains is heated it melts, emitting a benzoic odour, then chars, and finally leaves a residue weighing about 3·68 grains, which when dissolved in water requires for neutralisation from 69 to 70 grain-measures of the volumetric solution of oxalic acid.

In chemical constitution benzoic acid ($C_6H_5.COOH$) is very closely allied to phenol ($C_6H_5.OH$), and to salicylic acid ($C_6H_4.OH.COOH$).

Dose.—10 to 30 grains.

Pharmacological Action.—The action of benzoic acid is very similar in every respect to that of salicylic acid. When combined with sodium to form the benzoate it loses its local irritant effects, and to a very large extent its strong antiseptic properties. When benzoate of sodium is administered in large doses to animals, it first slightly stimulates the nervous system, causing a slight increase in the spinal reflexes and trembling, but never convulsions. This soon passes into ataxic movements, and finally paralysis. The pulse and respiration are quickened somewhat by small doses and slowed by large, death occurring from paralysis of respiration. With toxic doses there is usually a great fall of temperature.

When moderate amounts are administered to healthy men no special symptoms are seen; if fever be present

the temperature falls. It increases the secretion and excretion of bronchial mucus. It is excreted chiefly in the urine, and while in the kidney unites with glycocoll to form hippuric acid, in which form it is finally eliminated. It gives the urine an acid reaction, and also acts as a diuretic, probably by stimulating the kidney during its excretion. The amount of bile and of urea are both greatly increased by it.

Therapeutical Uses.—It may be employed as an antipyretic in the same way and in the same kind of cases as the salicylates. Benzoate of sodium has been used in acute rheumatism in doses of 120 to 300 grains daily. It acts in the same way as salicylate of sodium, but is scarcely so powerful. Sometimes it is greatly preferred by patients, on account of its pleasanter taste, and in some cases may be perfectly well substituted for the salicylate.

In phosphaturia and phosphatic calculi it may be given to acidify the urine. Large amounts per diem may be administered without harm, if necessary.

It has been given in the uric acid diathesis, in the belief that it diminishes the amount of uric acid. The experiments on which this use of benzoate of sodium was founded are, however, of very doubtful accuracy, and, as a matter of fact, clinical experience has failed to find that it is of striking value in such cases. It has been recommended in diphtheria, phthisis, scarlet fever, whooping cough, and similar diseases; but the benefit obtained is most probably due simply to its antipyretic action, and not to any special antiseptic effect which it exercises in the organism.

Unpleasant effects are occasionally seen after very large doses, such as a heavy feeling in the head, somnolence, profuse sweating, and depression.

SODII NITRIS.

Nitrite of Sodium.

$NaNO_2$.

Characters and Tests.—A white or yellowish-white, very slightly deliquescent crystalline salt, very soluble in water, with a feebly saline, not unpleasant taste. The solution is neutral or slightly alkaline, and when mixed with diluted sulphuric acid yields a gas (NO) which forms ruddy fumes (nitric peroxide, NO_2) in contact with the air. The aqueous solution, when mixed with solution of sulphate of iron and acetic acid, becomes of a deep brown colour. One grain of the salt dissolved in water and introduced into a nitrometer, and tested with iodide of potassium and diluted sulphuric acid, should liberate not less than 325 grain-measures of nitric oxide, the gas being almost completely absorbed by strong solution of sulphate of iron; corresponding to not less than 95 per cent. of nitrite of sodium. The aqueous solution of the salt must not give more than traces of precipitate with solution of chloride of calcium.

Dose.—2 to 5 grains in watery solution. The watery solution is quite stable in the absence of ferments and of acids stronger than nitrous acid.

Pharmacological Action.—A most complete account of the pharmacological action of sodium nitrite has been given by Dr. G. A. Atkinson (*Journ. of Anat. and Physiol.*, xxii., 1888), the following being a brief summary of his paper. When nitrite of sodium is administered to animals, there is rapid prostration, quickened pulse and respiration, slight diarrhœa, and a chocolate colour of the blood, easily seen in

the mucous membranes and eyes. After a time the animal ceases to respond to stimulation, and ultimately dies quietly. Its action is therefore exerted most prominently on the blood, and on the muscular and circulatory systems. When he himself took eight grains, he felt faint a few minutes after; the pulse was greatly quickened, but there was no visible flushing of the face. Larger doses do, however, cause slight flushing of the face, with fulness or throbbing in the head, and later there may be cyanosis of the face and hands. Nitrite of sodium converts the hæmoglobin of the blood into methæmoglobin, which is a chocolate-coloured compound much more stable than oxy-hæmoglobin, and which does not part with its oxygen nearly so readily. Its presence could be detected in the blood of the dog for from thirty to thirty-six hours after administration of five grains of sodium nitrite. This change in the blood is the chief cause of the dyspnœa in nitrite poisoning. No disintegration or other alteration of the red corpuscles was ever observed.

The heart is much quickened; in man, five minutes after the subcutaneous injection of 2 or 3 grains, the pulse-rate increased one-half. At the same time the blood-vessels dilate, and the blood-pressure falls greatly. The heart muscle itself is directly depressed, and this, along with the vascular dilatation, accounts for the fall in blood-pressure. Sphygmographic tracings show a lowering of arterial tension, which lasts for from three to five hours, after administration to a healthy man of 2 to 5 grains of sodium nitrite by the mouth. (See also Leech, *B.M.J.*, ii., 1885.)

On muscle nitrites have a very important action. After large doses the muscles are profoundly poisoned, and give no contraction on stimulation with electricity after death. With smaller doses, however, there is simply relaxation of the muscular structures. This accounts for the prostration,

and for the dilatation of the arteries; but the latter is also partly due to depression of the vasomotor centre. Both striped and non-striped muscles are affected.

The respiration is slightly accelerated by small doses, while large ones render it rapid, shallow, and even panting.

The brain and spinal cord are considerably depressed, while the temperature in the rectum falls after any but the smallest doses.

Observations made on the urine of healthy dogs showed that small or moderate doses do not modify the amount, while larger ones diminish it. Sugar is got in the urine only after the prolonged action of very large doses, just as with other nitrites; with the appearance of the sugar, there always comes on an increased flow of urine.

Nitrite of sodium is excreted chiefly in the urine, but traces can be got in the saliva and perspiration. Part of it is eliminated as nitrite, and part as nitrate, but the relative amounts of these vary greatly. Men in vigorous health rarely have nitrite reactions in their urine even after very considerable doses, while patients in bed give them comparatively readily, as in them oxidation is much less active. Excretion goes on for more than twenty-four hours.

Therapeutical Uses.—Nitrite of sodium is used for the same purposes as the other nitrites. The action begins more slowly (only after five minutes, or thereabouts), but it is more prolonged and gentle, the reason being that the sodium salt is comparatively slowly absorbed and excreted. Where a continuous action is desired, therefore, its use is preferable to that of nitrite of amyl.

It is used in angina pectoris, and in spasmodic asthma. In bronchitis where asthma is a more or less prominent feature,

it can be given along with expectorants, and in some cases greatly relieves the breathing. It is valueless in breathlessness due to emphysema, and benefit can only be expected in cases where the asthma is due to spasm of the bronchial muscles.

It is also given as a diuretic in Bright's disease, and in cases where the arterial tension is high. In some cases of aortic stenosis it considerably relieves the cardiac dyspnœa.

Nitrite of sodium has also been used to relieve muscular spasm in biliary, renal, and intestinal colic. In epilepsy it seems to be of very doubtful benefit.

SODII PHOSPHAS EFFERVESCENS.

Effervescent Phosphate of Sodium.

This preparation is made as follows:

Phosphate of Sodium, in crystals .	25	ounces or	100	parts
Bicarbonate of Sodium, in powder	25	„	100	„
Tartaric Acid, in powder . .	13½	„	54	„
Citric Acid, in powder . .	9	„	36	„
The final product should weigh .	50	„	200	„

Dry the phosphate of sodium until it has lost rather more than half its weight; powder and mix it with the other ingredients. Place the mixture in a dish or pan of suitable form heated to between 200° and 220° F. (93°·3 and 104°.4 C.), and when the particles of the powder begin to aggregate, stir them assiduously until they assume a granular form; then by means of sieves separate the granules of uniform and most convenient size, and preserve in stoppered bottles.

Dose.—¼ to ½ ounce; given in solution in water.

Therapeutical Uses.—It is an effervescent saline purgative containing phosphate, tartrate, and citrate of sodium.

SODII SULPHAS EFFERVESCENS.

Effervescent Sulphate of Sodium.

This preparation is made much in the same way as the preceding.

Sulphate of Sodium, in crystals .	25 ounces	or 100 parts
Bicarbonate of Sodium, in powder	25 „	100 „
Tartaric Acid, in powder . .	13½ „	54 „
Citric Acid, in powder . .	9 „	36 „
The final product should weigh about	50 „	200 „

Dry the sulphate of sodium until it has lost rather more than half its weight; then proceed exactly as in making the effervescent phosphate of sodium.

Dose.—¼ to ½ ounce. It is given in solution in water.

Therapeutical Uses.—It is an effervescent saline purgative.

STRAMONII FOLIA.

Stramonium Leaves.

The dried leaves of Datura Stramonium (nat. ord. Atropaceæ), or Thorn Apple; growing wild, and cultivated in Britain.

Characters.—The leaves are ovate, petiolate, about 6 inches long, smooth, pointed, unequal at the base, one side decurrent down the petiole, coarsely and sinuately angular-

toothed, minutely wrinkled, dark green. The upper surface usually brownish-green, and of a darker shade than the under surface; odour, faintly narcotic; taste, unpleasant saline, and bitter. They contain an alkaloid 'daturine' ($C_{17}H_{23}NO_3$), which is either identical with atropine, or is a mixture of atropine and hyoscyamine.

Stramonium leaves were struck out of the Pharmacopœia in 1885, but have been reinstated.

Action and Therapeutical Uses.—Stramonium has the same action as belladonna. The leaves are smoked in spasmodic asthma, either in a pipe or in the form of cigarettes. Many of the secret preparations for the cure of asthma contain stramonium leaves in large quantity. They are sometimes used as a poultice in painful local inflammations.

STROPHANTHUS.

Strophanthus.

The mature ripe seeds of Strophanthus hispidus, *var.* Kombé, freed from the awns. (Nat. ord. Apocynaceæ.) Zambesi and other districts in Africa.

Characters.—Oval acuminate, about $\frac{3}{5}$ inch long and $\frac{1}{8}$ inch broad, the base narrowed but blunt, the apex tapering to a fine extremity, flattened at the sides, the dorsal surface being more or less convex; greenish-fawn in colour, covered with appressed silky hairs; one side with a longitudinal ridge running from the centre to the apex. Kernel white and oily, consisting of a straight embryo, with two thin cotyledons, surrounded by a thin albumen; odour, characteristic; taste, very bitter. After soaking in water, the seed-coat is easily removed.

PREPARATION.—Tinctura Strophanthi, Tincture of Strophanthus, 1 in 20 rectified spirit.

The powdered and dried seeds are first freed from their oil and colouring matter by means of ether. The tincture is then made from the dried mare.

Dose.—2 to 10 minims.

Composition.—The seeds contain oil, albumin, resin, &c., and an active glucoside called strophanthin. When boiled with dilute acids it splits up into glucose and strophanthidin. Strophanthin is soluble in water and alcohol, insoluble in ether or chloroform. Its dose is about $\frac{1}{100}$ to $\frac{1}{30}$ grain.

Pharmacological Action.—Extracts made from the seeds of different species of strophanthus are used as arrow poisons in many districts of Central Africa. Strophanthus belongs to the digitalis group; that is to say, it is one of the many plants now known to pharmacologists, which exert an action similar to that of digitalis leaves. They are all primarily muscle poisons, and under the influence of toxic doses the heart and other muscles pass into a condition of rigor mortis. This, however, is not the condition which we wish to produce therapeutically, and hence the early stage of their action on muscle is of most interest to us.

Under the influence of moderate doses of substances belonging to the digitalis group the physical properties of muscle become altered. Its elasticity is increased, so that the muscle tends to extend and to contract more completely. But as all the blood passes very frequently through the heart, it receives much more of the poison than the other muscles do, and hence is affected at a time when the others are practically uninfluenced. In the same way the muscular

coats of the arterioles also get an undue share, but not to anything like the same extent as the heart, as only the blood going to their own district of supply passes through them.

When repeated small doses are given to man or to the lower mammalia the muscular fibres of the heart extend and contract more fully, and the arterioles contract. In addition the roots of the vagi nerves and their terminations in the heart are stimulated, so that the heart is slowed. As a consequence the diastole is prolonged and the systole is rendered more complete, and thus the heart both fills and empties itself more fully. More blood is thrown into the arterial system at each beat, the arterioles empty more slowly, and in consequence the blood-pressure is raised, the pulse is slowed, and the size and force of the pulse-waves are increased. The diuretic action of digitalis bodies depends on these changes in the circulatory system, and not on any direct effect on the secretory epithelium of the kidney. In health there is no increase of diuresis, but in cardiac dropsy the increase in the amount of urine is very marked. Here, owing to feeble action of the heart, the arteries are badly filled, the veins overfilled, and in consequence there is venous stasis, and transudation of serum into the tissues. Strophanthus (digitalis) strengthens the heart's action, and re-distributes the blood properly in the arterial and venous systems, and the exuded serum becomes absorbed into the vessels. In consequence the blood becomes too watery, and the excess of fluid is got rid of by the kidneys. Increased diuresis ceases as soon as the dropsy has passed off. Digitalis bodies, therefore, do not act well as diuretics when the blood-pressure is normal or above normal and the heart's action good. Too large doses tend to disturb digestion, and to cause nausea and vomiting.

Therapeutical Uses.—These are the same as in the case of digitalis. It was introduced into therapeutic use by Professor T. R. Fraser (*B.M.J.*, ii., 1885), who found that it was less apt than the preparations of digitalis to produce cumulative effects, and also that it acted more certainly and rapidly.

SULPHONAL.

Sulphonal; Diethylsulphon-dimethyl-methane.

$$C_7H_{16}S_2O_4 \quad (CH_3)_2C(SO_2C_2H_5)_2.$$

Mode of Preparation.—Dry hydrochloric acid gas is passed into equivalent parts of ethylmercaptan and acetone to form dithioethyl-dimethyl-methane. This substance, on being oxidised with permanganate of potassium, yields sulphonal. The reactions are as follows:

$$\underset{\text{acetone}}{\begin{matrix}CH_3\\CH_3\end{matrix}}>C=O+\underset{\text{ethylmercaptan}}{\begin{matrix}HS.C_2H_5\\HS\ C_2H_5\end{matrix}}=\underset{\text{dithioethyl-dimethyl-methane}}{\begin{matrix}CH_3\\CH_3\end{matrix}}>C<\begin{matrix}S.C_2H_5\\S.C_2H_5\end{matrix}+H_2O.$$

On oxidation we get $\underset{\text{diethylsulphon-dimethyl-methane}}{\begin{matrix}CH_3\\CH_3\end{matrix}}>C<\begin{matrix}SO_2.C_2H_5\\SO_2.C_2H_5\end{matrix}$, sulphonal.

Chemically it may be regarded as methan (marsh-gas), CH_4, in which the hydrogen atoms have been replaced by methyl and diethylsulphon radicals.

Characters and Tests.—It is in colourless, inodorous, nearly tasteless crystals; neutral to test-paper; melting at 258° F. (125°·5 C.). Soluble in 15 parts of boiling water, and in about 450 parts of cold water; soluble in about 50 fluid parts of cold rectified spirit, and very soluble in boiling alcohol; readily soluble in ether. It burns without residue.

If a mixture of a few grains with an equal weight of cyanide of potassium be heated, the odour of mercaptan is evolved; and when to the solution of the product in water excess of hydrochloric acid and a few drops of a solution of perchloride of iron are added, a reddish colour is developed.

Dose.—15 to 40 grains. It is best given in hot water or hot soup or milk. It may also be given finely powdered and suspended in water, or in capsules.

Pharmacological Action.—Sulphonal was first prepared by Baumann (*Ber. der. deutsch. chem. Gesellsch.*, 1885 and 1886), and its action was investigated and described by Kast. (*Berlin klin. Wochenschr*, 1888.) Experiments on dogs showed that it acted as a hypnotic, influencing the grey nervous matter of the brain and spinal cord. Shortly after administration there were ataxic movements, and a demeanour as if the animal were intoxicated; this soon passed into slumber. Sometimes on wakening the movements were still a little unsteady for a short time. Appetite was unimpaired, and there were no other unpleasant after-effects of its action. The heart and circulation are not depressed.

In man doses of 20 to 45 grains cause a feeling of sleepiness, of heaviness, or actual sleep. In about one-half to two hours after administration there ensues a peaceful, sound sleep, lasting for from five to eight hours. On wakening there are, as a rule, no unpleasant after-effects. The circulatory system is not depressed by it. Its absorption from the intestinal canal is always slow, but the rapidity varies greatly according to the form in which it is administered, and the state of the intestine. To promote rapid

absorption it should be given in hot solution, but even then sleep does not usually come on for about two hours.

It has no action on metabolism, and very shortly after absorption into the blood becomes decomposed. The decomposition products are found in the urine, and are soluble organic sulphur compounds, but have not been fully identified.

Therapeutical Uses.—So far sulphonal has only shown itself useful as a hypnotic. It may be given in all forms of sleeplessness, but, like most hypnotics, acts best where the insomnia is not due to grave organic disease. In the sleeplessness of advanced heart disease, or of pain, it is much inferior to morphine. It is, however, a safe, for the most part reliable, and very largely used, hypnotic.

Inconveniences attending its employment are that the advent of sleep is often delayed, and that on wakening there is sometimes some uncertainty of gait, and a distinct tendency to sleepiness. These all depend on its slow absorption or on too large a dosage, and can usually be avoided by giving the drug in solution about two hours before bedtime, and by properly apportioning the dose. In a few cases papular skin eruptions have been recorded after its use.

It is an extremely safe substance. Although it has been given sometimes in very large doses, only one fatal case has been reported. (*B.M.J.*, ii., 1890.) The patient swallowed more than an ounce of the drug in powder. He remained in a condition of complete stupor and anæsthesia, and died on the third day. In similar cases fatal results might be avoided by active purgation, so as to sweep the unabsorbed sulphonal out of the intestine.

SUPPOSITORIA GLYCERINI.

Glycerine Suppositories.

Gelatine (½ ounce) is soaked in sufficient water to soften it, and then glycerine (2½ ounces by weight) is added. The whole is liquefied on the water-bath, and evaporated until it weighs 1560 grains. Pour the product into suppository moulds of the size desired. Each suppository contains 70 per cent. by weight of glycerine.

Therapeutical Uses.—Glycerine suppositories are used in constipation. Shortly after one is introduced into the rectum an evacuation of the bowels takes place (generally in quarter of an hour or less, sometimes longer). An enema of glycerine (about one drachm) has the same effect.

SYRUPUS FERRI SUBCHLORIDI.

Syrup of Subchloride of Iron; Syrup of Ferrous Chloride.

One pint of this preparation is made as follows: Ferrous chloride is formed by dissolving iron wire (300 grains) in distilled water (1 ounce) and hydrochloric acid (2 fluid ounces) with the aid of gentle heat. Citric acid (10 grains) is then added to the flask, and the solution is filtered through paper into 10 fluid ounces of syrup. Then 2 drachms of water are passed through the filter into the syrup, and sufficient syrup added to make one pint. Its specific gravity should be about 1·340.

Dose.—½ to 1 fluid drachm.

Therapeutical Uses.—This is a mild, unirritating preparation of well-known efficacy in anæmia. The syrup prevents oxidation to ferric oxide.

Ferrous chloride is sometimes ordered as a pill, in which case it may be made up with powdered liquorice-root and extract of liquorice, or with powdered althæa-root and a little syrup.

TROCHISCI SULPHURIS.

Sulphur Lozenges.

These lozenges contain Precipitated Sulphur and Acid Tartrate of Potassium, made up with refined sugar, gum acacia, tincture of orange-peel, and mucilage of acacia.

Each lozenge contains 5 grains of sulphur and 1 grain of acid tartrate of potassium.

Dose.—1 to 6 lozenges.

Action and Therapeutical Uses.—Sulphur lozenges were recommended by Sir Alfred Garrod (*Lancet*, i. 1889) in the treatment of certain chronic affections of the alimentary canal, liver, skin, and joints. His usual plan is to prescribe one lozenge at night, sometimes two, and sometimes one night and morning. They acted as extremely mild laxatives, in a few exceptional cases as mild purgatives. In cases with pale, clay-coloured motions, these regained their normal colour during treatment. The lozenges were given continuously for weeks, months, and even years; and as they are easy to take, and cause little trouble, patients were easily induced to persevere with them.

He recommends their administration in hæmorrhoids, bleeding from the rectum, chronic bronchitis, skin diseases,

especially if gouty, such as acne, psoriasis, prurigo, and eczema. In rheumatoid arthritis, in chronic muscular rheumatism, muscular cramps, and all kinds of gouty manifestations, he obtained favourable results by this method of treatment.

UNGUENTUM CONII.

Ointment of Hemlock.

Hemlock juice, 2 fluid ounces, is evaporated to 2 fluid drachms at a temperature not exceeding 140° F. (60° C.); it is then mixed up with hydrous wool fat (¾ ounce) and finely powdered boric acid (10 grains).

Therapeutical Uses.—It is applied locally as an anodyne.

APPENDIX.

SOLUTION OF POTASSIO-CUPRIC TARTRATE.

Fehling's Solution.

No. 1.

Sulphate of copper, 346·4 grains, is dissolved in 5000 grain-measures of distilled water.

No. 2.

Caustic soda, 1¾ ounces, and tartarated soda, 4 ounces, are dissolved in 5000 grain-measures of distilled water.

When required for use, mix equal volumes of the solutions.

When Fehling's solution is kept made up it is apt to decompose.